

What is claimed is:

1. A substrate processing method, comprising the steps of:

5 (a) coating a resist on a substrate so as to form a resist film thereon;

(b) controlling a distribution of a dissolving characteristic against a developing solution used for a developing process in a direction of a thickness of the resist film, and

10 wherein the step (b) being performed before the developing process is performed for the substrate coated with the resist film.

2. The substrate processing method as set forth in claim 1,

15 wherein the step (a) has the step of coating on the substrate a resist that contains a material having an affinity against the developing solution used for the developing process, and

20 wherein the step (b) has the step of performing a predetermined process for the resist coated on the substrate so as to nonuniformly distribute the material in the direction of the thickness of the resist film.

3. The substrate processing method as set forth in claim 2,

25 wherein the step (b) has at least one of a heating process and a pressure reducing process.

4. The substrate processing method as set forth in

claim 1,

5        wherein the step (b) has the step of supplying the developing solution used for the developing process to the resist coated on the substrate so as to form an uneasily dissolvable layer on a front surface side of the resist film.

5.      A substrate processing method, comprising the steps of:

10        (a) coating a resist on a substrate so as to form a resist film thereon; and

      (b) controlling a moisture content of the resist coated on the substrate in a direction of a thickness of the resist film.

15        6.      The substrate processing method as set forth in claim 5, further comprising the step of:

      drying the resist film coated at the step (a) before the step (b),

20        wherein the step (b) is performed by supplying moisture on a surface of the dried resist film so as to control the moisture content.

7.      A substrate processing method, comprising the steps of:

      (a) coating a resist on a first surface of a substrate;

25        (b) heating the resist coated on the first surface of the substrate from the first surface side and a second surface side opposite to the first surface of the

substrate; and

(c) half-exposing the heated resist.

8. The substrate processing method as set forth in  
claim 7,

5 wherein the step (b) has the steps of:

(d) heating the substrate from the first surface  
side at a first temperature; and

(e) heating the substrate from the second surface  
side at a second temperature.

10 9. The substrate processing method as set forth in  
claim 8,

wherein the step (d) is performed by heating the  
substrate from the first surface side at a temperature  
in the range from 70 °C to 200 °C.

15 10. The substrate processing method as set forth in  
claim 8,

wherein the step (e) has the step of heating the  
substrate from the second surface side at a temperature  
in the range from 90 °C to 150 °C.

20 11. The substrate processing method as set forth in  
claim 7, further comprising the step of:

(f) controlling a pressure applied at least to the  
resist during the step (b).

12. The substrate processing method as set forth in  
25 claim 11,

wherein the step (f) has the step of reducing the  
pressure applied to the resist from the atmospheric

pressure by 5 Pa to 100 Pa.

13. The substrate processing method as set forth in  
claim 7,

5 wherein the step (b) has the step of controlling a  
heating time for which the resist is heated in the range  
from 60 seconds to 300 seconds.

14. A substrate processing method, comprising the steps  
of:

10 (a) coating a first resist that exposure-reacts  
with a first exposure energy on a substrate;

(b) coating a second resist that exposure-reacts  
with a second exposure energy that is smaller than the  
first exposure energy on the surface of the first  
resist; and

15 (c) half-exposing the first resist and the second  
resist with a mask that causes the first resist to be  
exposed with the first exposure energy and the second  
resist to be exposed with the second exposure energy.

16. The substrate processing method as set forth in  
20 claim 14, further comprising the step of:

(d) drying the first resist,

wherein the step (d) is performed between the step  
(a) and the step (b).

25 16. The substrate processing method as set forth in  
claim 14,

wherein the step (a) is performed while the  
substrate is being rotated.

17. The substrate processing method as set forth in  
claim 14,

wherein the step (a) is performed while moving a  
first nozzle for coating the first resist on the surface  
5 of the substrate; or

wherein the step (b) is performed while moving a  
second nozzle for coating the second resist on the  
surface of the substrate.

18. The substrate processing method as set forth in  
10 claim 14,

wherein the step (a) is performed while moving a  
first nozzle for coating the first resist on the surface  
of the substrate; and

15 wherein the step (b) is performed while moving a  
second nozzle for coating the second resist on the  
surface of the substrate.

19. The substrate processing method as set forth in  
claim 14, further comprising the step of:

20 (e) coating an organic solvent on the surface of  
the first resist,

wherein the step (e) is performed between the step  
(a) and the step (b), and

wherein the second resist is coated on the surface  
of the first resist coated with the organic solvent.

25 20. The substrate processing method as set forth in  
claim 14,

wherein the second exposure energy is 50 per cent

to 70 per cent of the first exposure energy.

21. A substrate processing method, comprising the steps of:

(a) coating a first resist that exposure-reacts with a first exposure energy on a substrate;

5 (b) flattening a front surface of the first resist coated on the substrate;

(c) coating a second resist that exposure-reacts with a second exposure energy that is smaller than the 10 first exposure energy from the front surface side of the flattened first resist; and

(d) half-exposing the first resist and the second resist with a mask that causes the first resist to be exposed with the first exposure energy and the second resist to be exposed with the second exposure energy.

15 22. A substrate processing apparatus, comprising:

resist film forming means for coating a resist on a substrate so as to form a resist film thereon; and

20 controlling means for controlling a distribution of a dissolving characteristic of the resist against a developing solution used for developing the resist in a direction of a thickness of the resist film.

25 23. A substrate processing apparatus capable of transferring a substrate having a first surface and a second surface opposite to the first surface, to an exposing unit for half-exposing a resist coated on the substrate, comprising:

a coating portion for coating the resist on the first surface of the substrate;

5 a heating portion for heating the resist coated on the first surface of the substrate from the first surface side and the second surface side; and

an interface portion for allowing the substrate heated by the heating portion to be transferred to the exposing unit.

24. The substrate processing apparatus as set forth in 10 claim 23,

wherein the heating portion includes:

a first heating plate for heating the resist coated on the first surface of the substrate from the first surface side at a first temperature; and

15 a second heating plate for heating the resist coated on the first surface of the substrate from the second surface side at a second temperature.

25. A substrate processing apparatus, comprising:

a holding portion for holding a substrate;

20 a first nozzle for coating to the substrate held by the holding portion a first resist that exposure-reacts with first exposure energy;

a second nozzle for coating to a surface of the first resist a second resist that exposure-reacts with a 25 second exposure energy smaller than the first exposure energy; and

a driving portion for driving at least the second

nozzle of the first nozzle and the second nozzle along with the surface of the substrate held by the holding portion.